

Master and Engineer Internship: 2020-2021

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Research group : AIMAN-FILMS

Title : IMAGE-GUIDED MAGNETIC CONTROL OF DRUG VECTORS TO TREAT CANCER TUMORS

Abstract :

Today, cancer can be treated efficiently in a variety of ways, including surgical, chemical and biological procedures. Although the landscape of cancer treatment has dramatically changed over the last four decades, there are still many factors that lead to failure in cancer therapy. Indeed, multidrug resistance is one of the most significant problems in oncology today. Immunotherapy has emerged as an innovative and chemicals free way to eliminate cancer cells through the transfer of ex vivo expanded and activated immune cells, such as macrophages. Recently, exosomes, nanometer scale extracellular vesicles secreted by most cells, have proved to be effective in reducing cancer growth. Although exosomes may be used as anti-cancer therapeutic agents, they are inert vesicles, without any ability to move autonomously. Therefore, they must be steered by some physical mean until they reach the target site. In this project, named ESCULAPE for Engineered System to treat Cancer Tumors Using Long distance Actuation to Pilot Exosomes, image-guided therapy based on exosomes will be developed.

The goal of this student project is to design a magnetic system to move and steer the exosome loaded microbeads to the target tumor. Although primary tests will be performed *in vitro*, the system must be tailored to operate properly *in vivo* when tested on animal models. Competences and/or motivation for experimental physics, magnetics and ultrasound are required. The candidate should be open to work at the interface between engineering, cellular biology and medicine.